

I B.Tech Supplementary Examinations, Aug/Sep 2008

ANALYTICAL CHEMISTRY

(Chemical Engineering)

Time: 3 hours

Max Marks: 80

**Answer any FIVE Questions
All Questions carry equal marks**

1. (a) What is cupferron? Discuss its use as an organic precipitant with suitable examples. [8]
(b) Describe a method for the determination of iron by gravimetric analysis. [8]
2. Write the structure of EDTA? Explain its importance as complexing agent in volumetric analysis. [16]
3. (a) Explain the use of UV-visible spectroscopy in the estimation of manganese in a steel sample.
(b) Calculate molar absorptivity if 1.25×10^{-5} solution had an absorbance of 0.210 with an optical path length of 10 mm at 430 nm. [8+8]
4. (a) Write a note on different regions in an IR spectrum.
(b) Explain the phenomenon of Fermi resonance in IR spectroscopy. [8+8]
5. (a) Describe the titration curve for NaOH Vs CH_3COOH by conductometry and explain it in detail.
(b) Write a note on hydrogen electrode. [8+8]
6. (a) Write short notes on amperometric titrations and discuss its importance in the analysis of metal ions.
(b) Calculate the diffusion coefficient of trivalent ion if $C = 3$ moles/ liter, $D = 3 \text{ cm}^2/\text{sec}$, $m = 1.5 \text{ mg/sec}$, and $t = 3$ seconds. [10+6]
7. (a) What are the advantages of solvent extraction process?
(b) Enumerate the various applications of Thin Layer Chromatography. [8+8]
8. Describe the various components of gas chromatography with a block diagram and describe their functioning. [16]

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1. (a) Write short notes on digestion of a precipitate. [6]
(b) Explain the principle and advantages in precipitation from homogeneous solutions? [10]
2. (a) Write an account of neutralization indicators. [8]
(b) Give the principle and procedure for the estimation of brass solder by volumetric titration method. [8]
3. (a) Describe the applications of UV-Visible spectroscopy in quantitative analysis.
(b) A sample having (mol.wt 122, 1.22 mg) was dissolved in methanol and its absorbance was recorded in UV radiation. Calculate value of extinction coefficient if the optical density of the solution is 0.20 and the path length is 1.0 cm. [8+8]
4. (a) Discuss the use of IR spectroscopy for functional group analyses.
(b) Explain the significance of force constant of a bond in IR spectroscopy. [8+8]
5. (a) Describe the changes in conductance that occur when an acid like acetic acid is titrated against base like NaOH. [8]
(b) Write short notes on
 - i. Glass electrode
 - ii. Conductometric cell. [4+4]
6. (a) Explain the process of constant current coulometric analysis. [8]
(b) Describe the principle involved in the determination of zinc by polarography. [8]
7. (a) Explain the principle and applications of thin layer chromatography.
(b) Briefly outline the various essential requirements for a good extractant. [8+8]
8. Explain the following:-
 - (a) Compare and differentiate between gas chromatography and HPLC.
 - (b) Various methods of packing columns in HPLC. [8+8]

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1. (a) Write an account on precipitating reagents. [10]
(b) Discuss the limitations of gravimetric analysis. [6]
2. (a) Give the definition of a masking agent with suitable examples. [6]
(b) Explain the EDTA method for the determination of hardness of water. [10]
3. (a) Explain apparent deviations from Beer's laws.
(b) A solution of methyl orange having concentration of 1.25×10^{-4} M when exposed to light showed an absorbance of 0.25 for which extinction coefficient is known to be 1000. The same cell was now replaced with a 2.0×10^{-4} M solution of malachite green which showed an optical density of 0.40. Calculate the extinction coefficient of malachite green. [8+8]
4. (a) Differentiate between the following pairs compounds by IR spectroscopy.
 - i. Ethanol and dimethyl ether
 - ii. Acetaldehyde and acetic acid
 - iii. Propanoic acid and methyl acetate
(b) Discuss various types of stretching and bending vibrations in IR spectroscopy. [8+8]
5. (a) Explain the advantages of potentiometric titrations.
(b) Describe the conductometric titration of HCl Vs NH_4OH . [8+8]
6. (a) Discuss the use of polarography in the determination of inorganic cations and explain advantage over the other methods.
(b) Explain the principle involved in amperometric titrations with suitable examples. [8+8]
7. (a) Discuss the principle, technique and important applications of thin layer chromatography. [10]
(b) Write short notes on radial paper chromatography. [6]
8. Write short notes on
 - (a) Flame ionization detector in gas chromatography.
 - (b) Applications of HPLC. [8+8]

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1. (a) Explain the basic principle involved in gravimetric analysis. [10]
(b) What is neocupferron? Give its structure and explain its significance in precipitation method. [6]
2. (a) What is a standard solution? What are the requirements of a primary standard substance? [8]
(b) How is the hardness of water expressed? Describe a volumetric method for the determination of hardness of water. [8]
3. (a) Draw the block diagram of a UV-Visible spectrometer and explain its functioning.
(b) If the energy associated with one Einstein of electromagnetic radiation is 6.6×10^{12} ergs/mole, what is its wave length in $\text{\AA}$? ($h = 6.6 \times 10^{-27}$ ergs/mole) [8+8]
4. (a) write short notes on
 - i. Over tones
 - ii. Vibrational coupling
 - iii. Fermi resonance[12]
(b) Explain why water cannot be used as a solvent in IR spectroscopy. [4]
5. (a) What is the principle of conductometric titrations? what are its advantages?
(b) Define pH and describe a method for determination of pH of a solution. [8+8]
6. (a) Derive an expression for half-wave potential. Explain its significance in polarographic analysis. [12]
(b) State and explain Illkovic equation. [4]
7. (a) Discuss the principle, technique and important applications of thin layer chromatography. [10]
(b) Write short notes on radial paper chromatography. [6]
8. Explain the following:-
 - (a) Analytical applications of gas chromatography.
 - (b) Various types of pumps and injection systems used in HPLC. [8+8]
